

'Monograph of the British *Desmidiæ*,' either in microscopical observation, by faithful outlines, or in the determination of any difficult point.

Mr. Hassall also is a gentleman whom I respect, and for most of my knowledge of the British *Conjugatæ* I am indebted to his kindness.

I am, Gentlemen, your obedient servant,

EDWARD JENNER.

On the Disease of the Plantain. By GEORGE R. BONYUN, M.D.
Communicated by W. H. Campbell, Esq., LL.D., Secretary of the Royal Agricultural and Commercial Society of British Guiana.

The varieties of the edible plantain, which are known and cultivated throughout the West Indies, Africa and the East, are all of them reducible to two species, viz. the plantain and the banana (*Musa paradisiaca* and *Musa sapientum*). The difference between these two plants is even so slight as to be scarcely specific; it is therefore most probable that there was originally but one stock, from which they have by cultivation and change of locality been derived. It is therefore necessary to determine with exactness, if possible, whether the plantain or banana (whichever be the parent stock) exists anywhere at present, or has been known to have existed as a perfect plant, that is, bearing fertile seeds, or whether it has always been in the imperfect state, that is, incapable of being procreated by seed, the only state in which it exists in this colony.

In the oldest botanical descriptions of the plantain, bakova, pisang, banana, bihai, or by whatever name it is known, it is invariably described as an anomalous plant not perfecting its seeds; nor is there any traveller who has described a plant which could be considered to be the plantain in its uncultivated state.

In Gerard's 'Herbal,' printed in 1636, p. 1464, there is an excellent drawing of a bunch of plantains, and it is described as seedless. Plumier, in his 'Nova Plantarum Americanarum Genera,' printed in 1703, gives a like description of the plantain. Linnæus, in his 'Species Plantarum,' anno 1763, describes four species, *Musa paradisiaca*, *sapientum*, *Bihai* and *Troglodytarum*, which latter, on the authority of Rumphius, he says, bears many seeds (*hæc gerit semina multa*). He supposes the two former to be hybrids produced by impregnating the Bihai with some congeners unknown to him. Since Linnæus's time the "Bihai" has been found to belong to a different genus than *Musa*; it is now called *Heliconia humilis*, is a native of South America, and produces fertile seeds. Whether Linnæus be right in his conjecture that the Bihai is the stock-plant of the plantain, it is almost impossible to ascertain; but the absence of any description of a wild seed-bearing plantain renders it highly probable that the cultivated species are hybrids produced long ago. The banana, from time immemorial, has been the food of the philosophers and sages of the East; and almost all travellers throughout the tropics have described these plants exactly as they are known to us, either as a sweet fruit eaten raw, or a farinaceous vegetable roasted or boiled.

It is remarkable that the plantain and banana should be indigenous, or at all events have been cultivated for ages both in the old and new world. Numerous South American travellers describe some one of these plants as being indigenous articles of food among the natives, thus showing (if the plantain and its variety be hybrids) a communication between the tropics of America, Asia and Africa long before the time of Columbus. The older writers on this colony consider the plantain to be a native. Thus Hartsinck in his 'History of Guiana,' vol. i. p. 71, describes under the head of "description of wild trees" the fruit of the plantain or wild banana tree as being eaten by the Indians roasted or ripe, &c., while the banana is under the description of cultivated trees. Belin, 'Description Géographique de la Guyane,' p. 49, in like manner describes the plantaine, or plantin, as being a food used by the Indians, &c. It is remarkable that Sir Robert Schomburgk likewise found a large species of edible plantain far in the interior. It appears to me to be quite clear therefore that the plantain is either a hybrid, or its power of procreation by seed has been destroyed long ago by cultivation, and that it is not known to exist anywhere in a perfect state; in either of which cases, any attempt to improve *our present stock* by the introduction of suckers from elsewhere must be totally futile. I need scarcely remark, that should the suppositions with regard to the hybridity of the plantain be incorrect, and that in certain localities to us at present unknown the plant matures its seed, the seedlings would require long cultivation by repeated transplantation of suckers to deprive the fruit of its seed, or in other words, to render it edible.

If the proposed introduction of plantain suckers from Matanzas, Porto Rico, or other countries, be with the view of entirely substituting them for our present stock, and thus getting rid of the disease, a very serious matter for consideration is presented to us, viz. Is the disease hereditary or owing to imperfection in the plant itself, or is it caused by unfit soil or imperfect tillage? If it be hereditary, then the only means left is totally to eradicate the present stock and to introduce a new one. If, on the other hand, the disease be one of locality, then the introduction of new plants would be merely exposing them to the same cause of destruction. The cause of the disease has been considered by some to be a species of beetle, which destroys the root or finds its way into the body of the tree. This however is a conjecture totally unsupported by any facts, the minutest investigation not disclosing the existence of any such animals in the diseased plantain tree, or at least in that relation to the tree which would in any way justify the supposition that they were the cause of the disease. Another supposition has been that the disease is similar to the smut in wheat, but is equally as unfounded as the beetle theory, no fungi being discovered in the diseased parts, even by the aid of a very powerful achromatic microscope.

Dr. Aanzorg's theory is, that there is a deficiency of certain chemical substances in the soil, and his experiments appear to render his supposition very probable. On the other hand, several planters declare that the youngest suckers from a diseased stock grow up for

the most part diseased, wherever planted. These conflicting opinions must be cleared up by experiment. In the meantime, I believe that I can point out the "seat of the disease," which is at all events the first step towards the discovery of its cure. If a plantain tree be stripped of its leaves from the root upwards, it will be found to consist of a number of joints—the bunch of plantains being a continuation of the upper joint, and the spire being the upper leaf rolled up—exactly similar to a cane and its arrow—the bunch being the organic apex of the plantain tree, in the same manner as the cane arrow is the organic apex of the cane plant.

Of the various vessels and tissues which are necessary to vegetable life, the plantain tribe abounds in what are called spiral vessels or tracheæ; and if a healthy plantain tree be examined from the root upwards as far as the fruit, these vessels will be found in continuous lines; and even in the farina of the plantain they are detected in an extreme state of tenuity. On further examination, these spirals (as has been known to botanists for some time) are found to be composed of numerous fasciculi, and are contained in tubes from whence they can be drawn forth, having a translucent appearance, and being perfectly free from any adherent matter. From the large number of these vessels in the plantain tribe, it is evident that their functions must be important, and that any impediment to their healthy action must be attended with an imperfect development in some part of the plant. Now if a plantain tree bearing a bunch of plantains in a more or less diseased state be examined carefully, a certain number of these tubes containing spirals from the roots up, through the culm or body of the tree into the bunch, will be found to be filled with a ferruginous-looking fluid of a more or less dark colour, and if the spiral vessels be drawn forth from their tubes, this matter will be seen to collect upon them in minute drops; the spirals will also be of the same colour as the substance contained in the tubes. A bunch of plantains in the extreme state of disease, containing no farina, but merely the dissepiments of the cells, will have a large number of the spiral tubes, particularly in the circumference of the culm, filled with a dark ochreous-coloured fluid, while the number of diseased tubes will be fewer, and the colour of the fluid contained more of a yellowish colour, in less diseased plants.

In the stock of a small poor bunch of plantains, but still containing farina and edible, only a trace here and there of the abnormal matter was found. This peculiar state is not confined to the full-grown plant, but the youngest suckers show the disease in a greater or less degree. All the other tissues and vessels of diseased trees I have found after the most careful investigation to be quite sound. The decay of the leaves, and subsequent rottenness and destruction of the plant, is owing to its diminishing vitality, and has nothing to do with the specific disease. Any mechanical injury sufficiently violent to diminish the vigour of the plant, would be followed by similar decay and rottenness. I am therefore fully convinced, that, whatever may be the cause of the disease, the seat of it is in the tubes containing the spiral vessels, which are invaded by an abnormal

fluid, which is inimical to the formation of the pulp in the fruit, or impedes the spirals in the due performance of their functions. The chemical composition of this fluid, and whether it be absorbed directly from the soil, or eliminated within the plant in consequence of functional disease of its organs, will form the subject of future investigation; and I would venture to augur, the colony having now the assistance of a gentleman of high scientific acquirements, that not only the cause, but the cure of this very destructive disease will be shortly discovered.

METEOROLOGICAL OBSERVATIONS FOR JAN. 1846.

Chiswick.—January 1. Fine. 2, 3. Frosty: fine: overcast. 4. Rain. 5. Sharp frost: cloudy: clear and frosty. 6. Drizzly. 7. Overcast and mild throughout the day and night. 8. Cloudy and fine. 9. Uniformly overcast. 10. Overcast: drizzly rain. 11. Hazy and drizzly. 12. Cold haze. 13. Hazy: very fine. 14. Foggy: overcast and fine. 15. Fine. 16. Thick fog: rain at night. 17. Hazy: drizzly: cloudy and mild. 18. Foggy: rain at night. 19. Constant rain: boisterous, with rain at night. 20. Clear and fine. 21. Rain: densely clouded and mild: boisterous, with rain at night. 22. Boisterous, with rain: densely clouded. 23. Heavy showers. 24. Hazy and mild. 25. Rain. 26. Showery: heavy rain at night. 27. Clear: cloudy: rain at night. 28. Rain: cloudy: very high tide in the Thames: clear. 29. Rain. 30. Overcast. 31. Cloudy: windy at night.

| | |
|--|------------|
| Mean temperature of the month | 43°·54 |
| Mean temperature of January 1845 | 38·69 |
| Average mean temperature of Jan. for the last twenty years | 36·46 |
| Average amount of rain for the last twenty years | 1·60 inch. |

Boston.—Jan. 1. Stormy: rain last night. 2. Fine. 3. Cloudy. 4. Rain. 5. Fine. 6. Rain. 7. Cloudy. 8. Fine. 9—13. Cloudy. 14, 15. Fine. 16. Foggy. 17. Cloudy: rain A.M. and P.M. 18. Foggy. 19. Rain: rain early A.M.: rain P.M. 20. Windy: rain early A.M. 21. Cloudy: rain P.M. 22. Cloudy and stormy: rain early A.M. 23. Fine. 24. Cloudy: rain early A.M. 25. Fine: rain early A.M. 26. Cloudy: rain early A.M. 27. Fine. 28, 29. Rain. 30, 31. Cloudy.—N.B. Not so warm a January since January 1834: the average of that month was 44°·3.

Sandwick Manse, Orkney.—Jan. 1. Snow-showers. 2. Fine: frost: cloudy. 3. Cloudy: clear. 4. Clear: showers. 5. Bright: showers. 6. Damp: clear. 7. Cloudy: showers. 8. Showers: clear. 9. Cloudy: clear. 10. Rain: cloudy. 11. Drizzle: damp. 12. Drizzle: hazy. 13. Bright: cloudy. 14. Damp: cloudy. 15. Rain: drizzle. 16. Clear. 17. Damp. 18. Bright: cloudy. 19. Damp: showers. 20. Rain: drizzle. 21. Rain: clear. 22. Damp: rain. 23. Fine: damp. 24. Fine: frost: damp: aurora. 25. Rain: cloudy. 26. Damp. 27. Damp: rain: clear. 28. Cloudy: showers. 29. Showers. 30. Cloudy: rain. 31. Drizzle: showers.

Applegarth Manse, Dumfries-shire.—Jan. 1. Snow-showers. 2. Frost: clear and fine. 3. Wet all day. 4. Fine A.M.: shower P.M. 5. Frost A.M.: rain P.M. 6, 7. Showery. 8. Fair. 9, 10. Slight drizzle. 11. Slight drizzle: fog. 12. Fair and mild. 13. Fair A.M.: rain P.M. 14. Fair: one slight shower. 15. Wet A.M.: cleared: fine. 16. Frost, slight: fine. 17. Fair A.M.: slight shower P.M. 18. Fair, but cloudy. 19. Rain nearly all day. 20. Rain all day: flood. 21. Fair, but cloudy. 22. Drizzling rain. 23. Rain and fog. 24. Thick fog. 25. Heavy rain: flood. 26. Drizzling rain. 27. Rain A.M.: fair: rain P.M. 28—31. Rain.

| | |
|---|--------------|
| Mean temperature of the month | 43°·0 |
| Mean temperature of January 1845 | 36·1 |
| Mean temperature of Jan. for twenty-three years | 34·5 |
| Mean rain in January for eighteen years | 2·57 inches. |